Synthetic Biology

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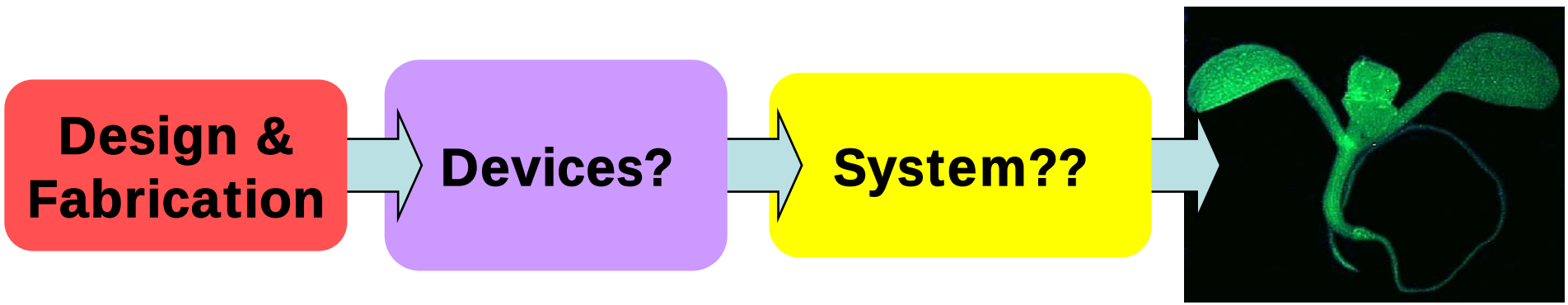
Director,
Registry of Standard Biological Parts, MIT

Web site: parts.mit.edu

Life of a Biologist:

Struggle, Limited Success, Struggle…



A Better Life:

Struggle, Success, Predictable Success

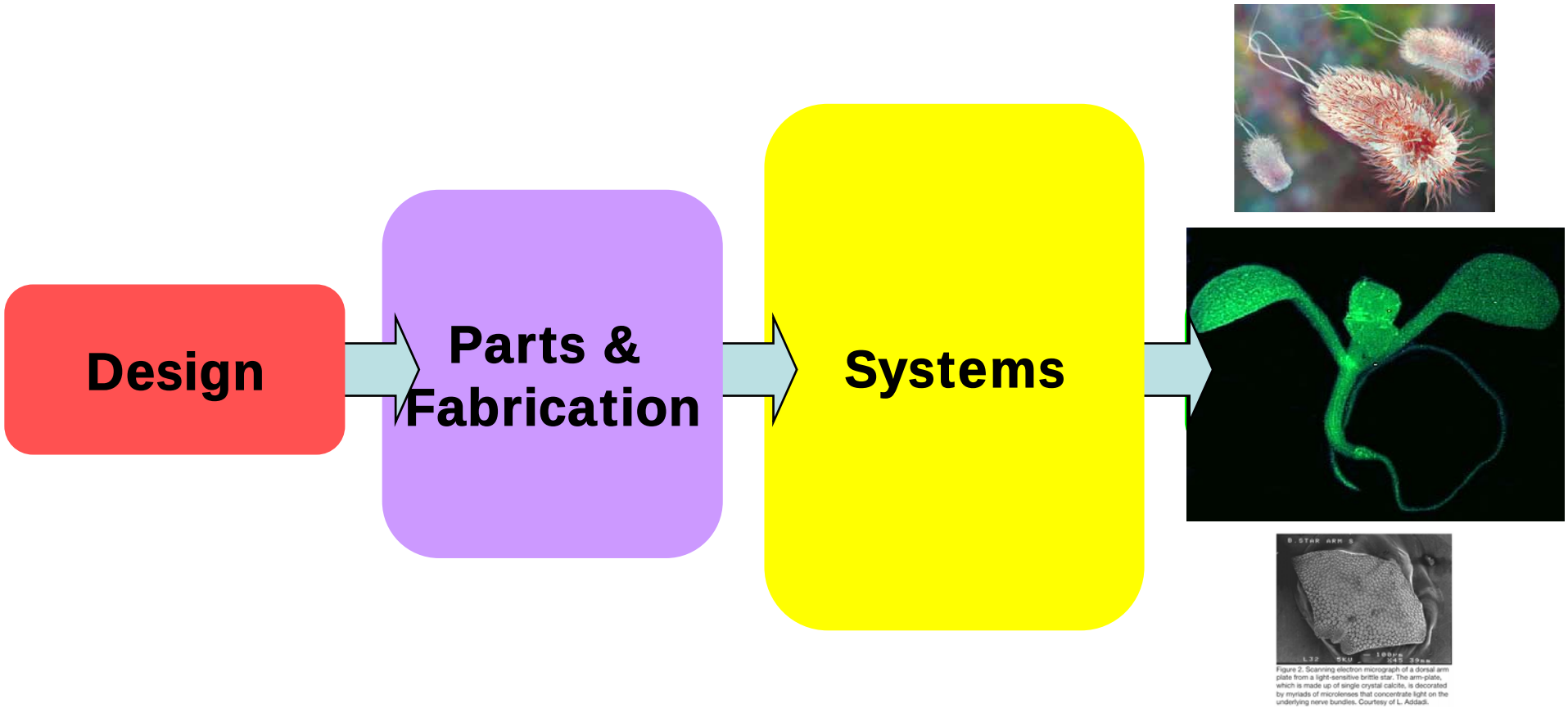
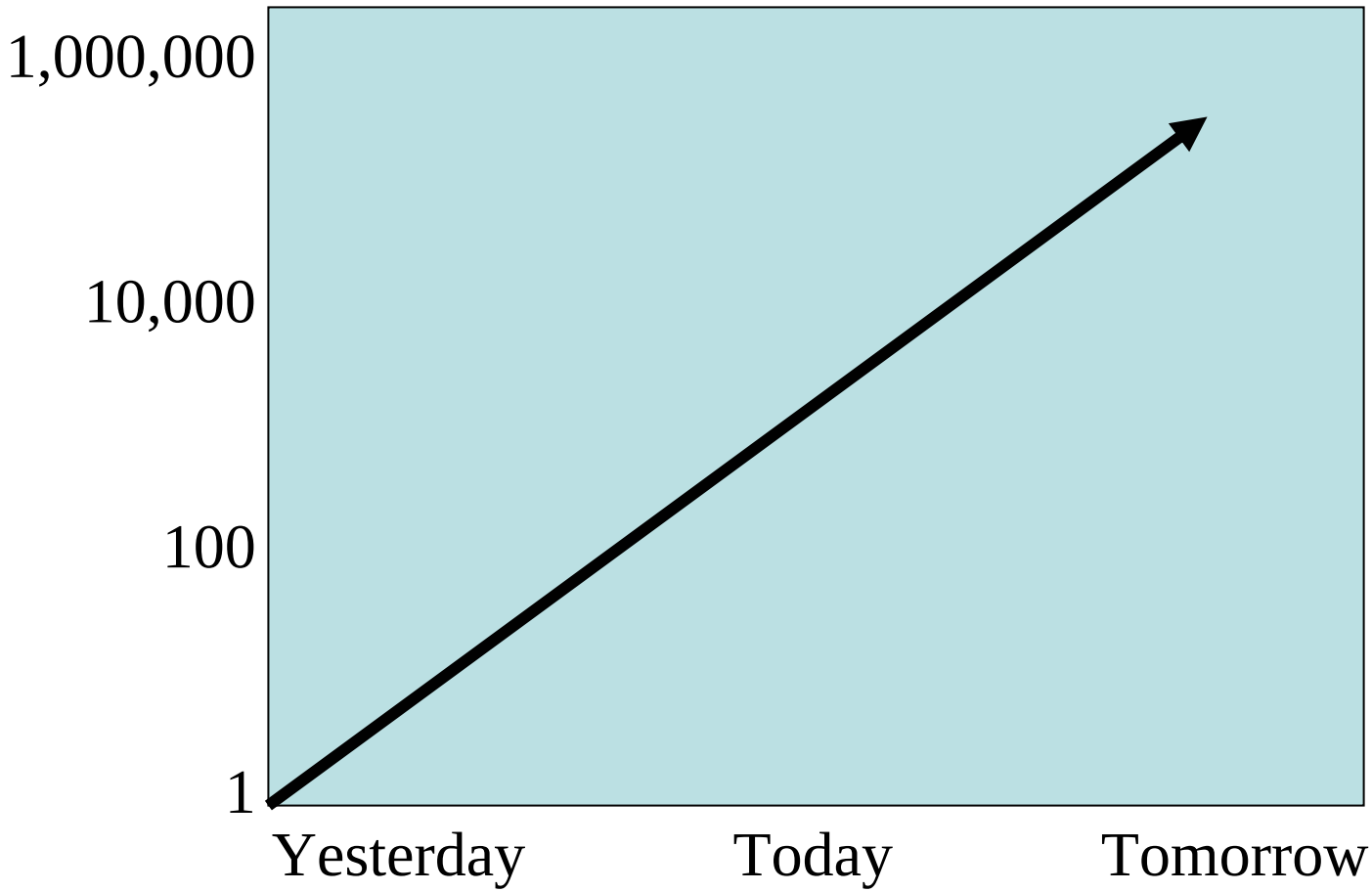


Figure 2. Scanning electron micrograph of a dorsal arm plate from a light-sensitive brittle star. The arm-plate, which is made up of single crystal calcite, is decorated by myriads of microlenses that concentrate light on the underlying nerve bundles. Courtesy of L. Addadi.

Moore's Law for Biology



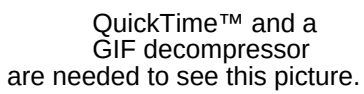
An Engineering Question

Can simple biological systems be built from standard, interchangable parts and operated in living cells?

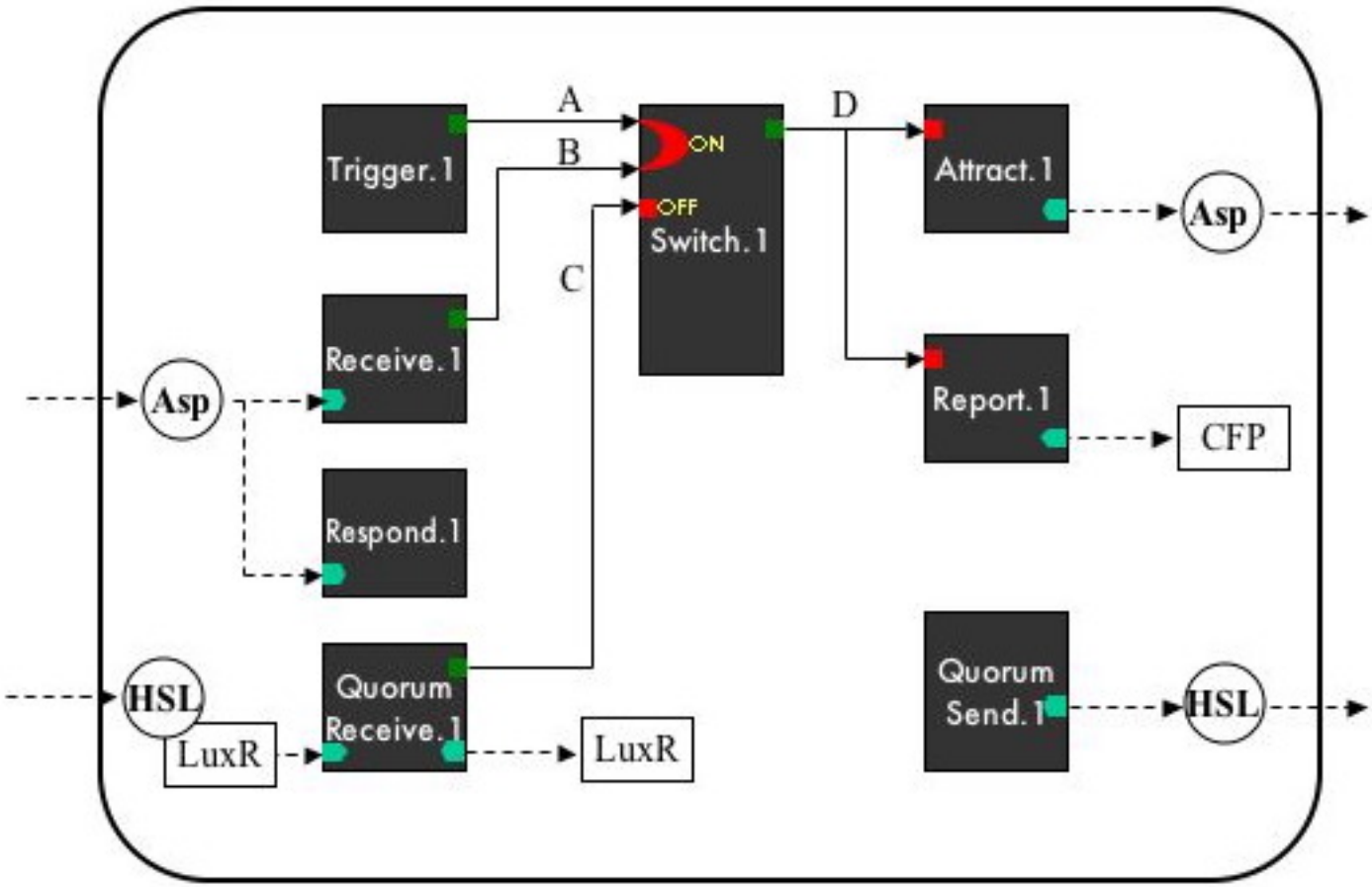
Or, is biology so complex that each case is unique?

Education Driving Research

E.coli-brator



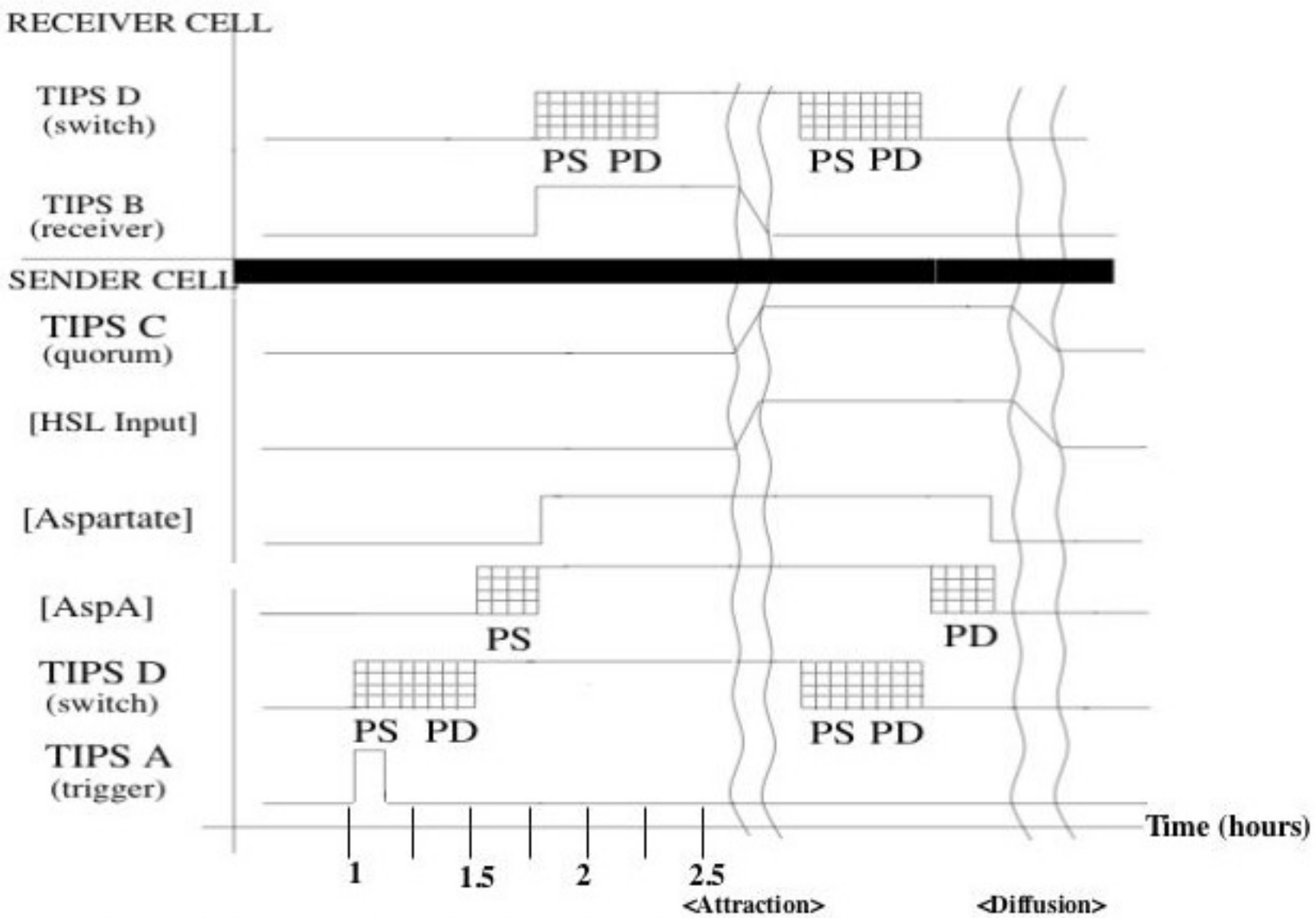
Device-Level System Diagram



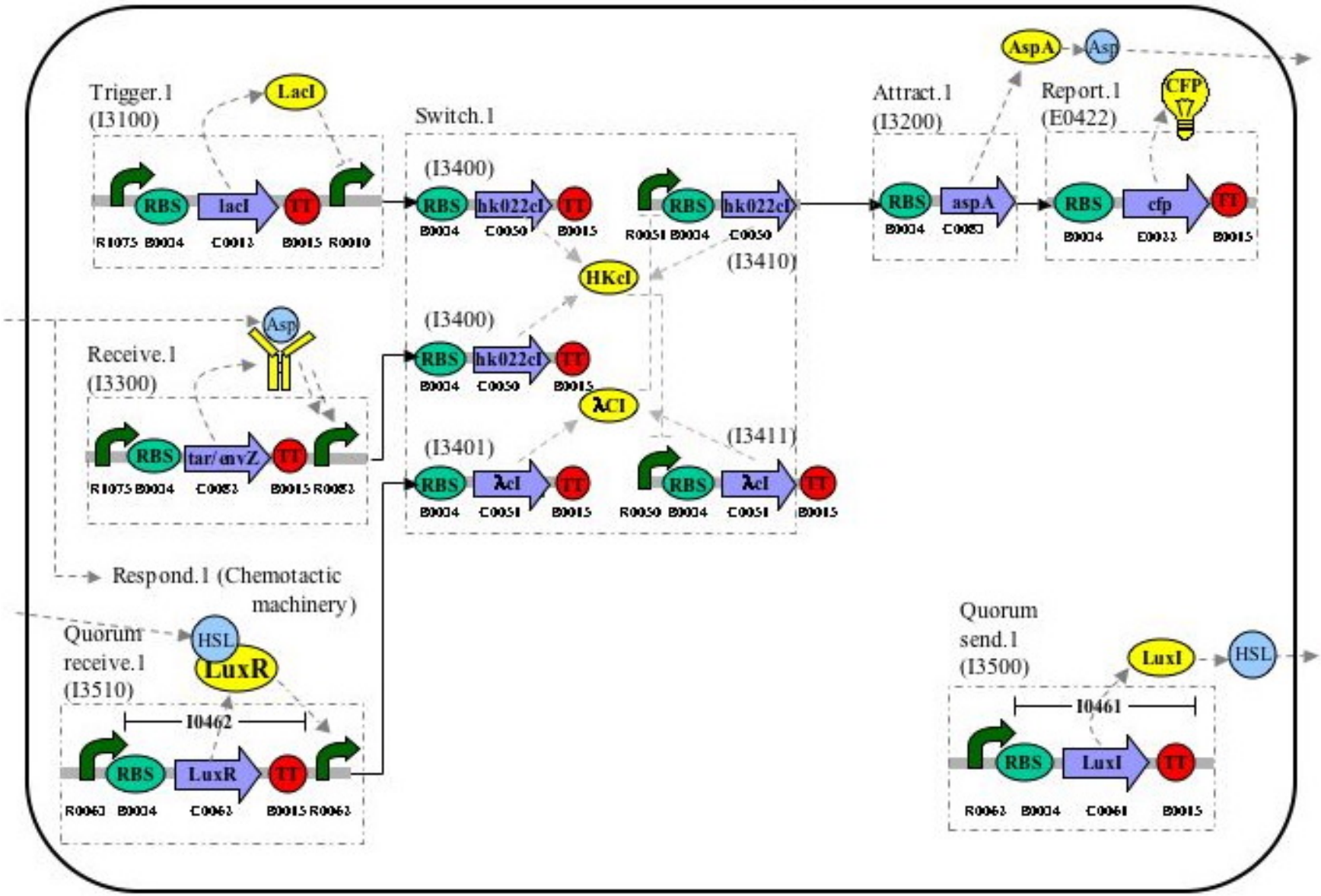
Population-Level Simulations

QuickTime™ and a
Video decompressor
are needed to see this picture.

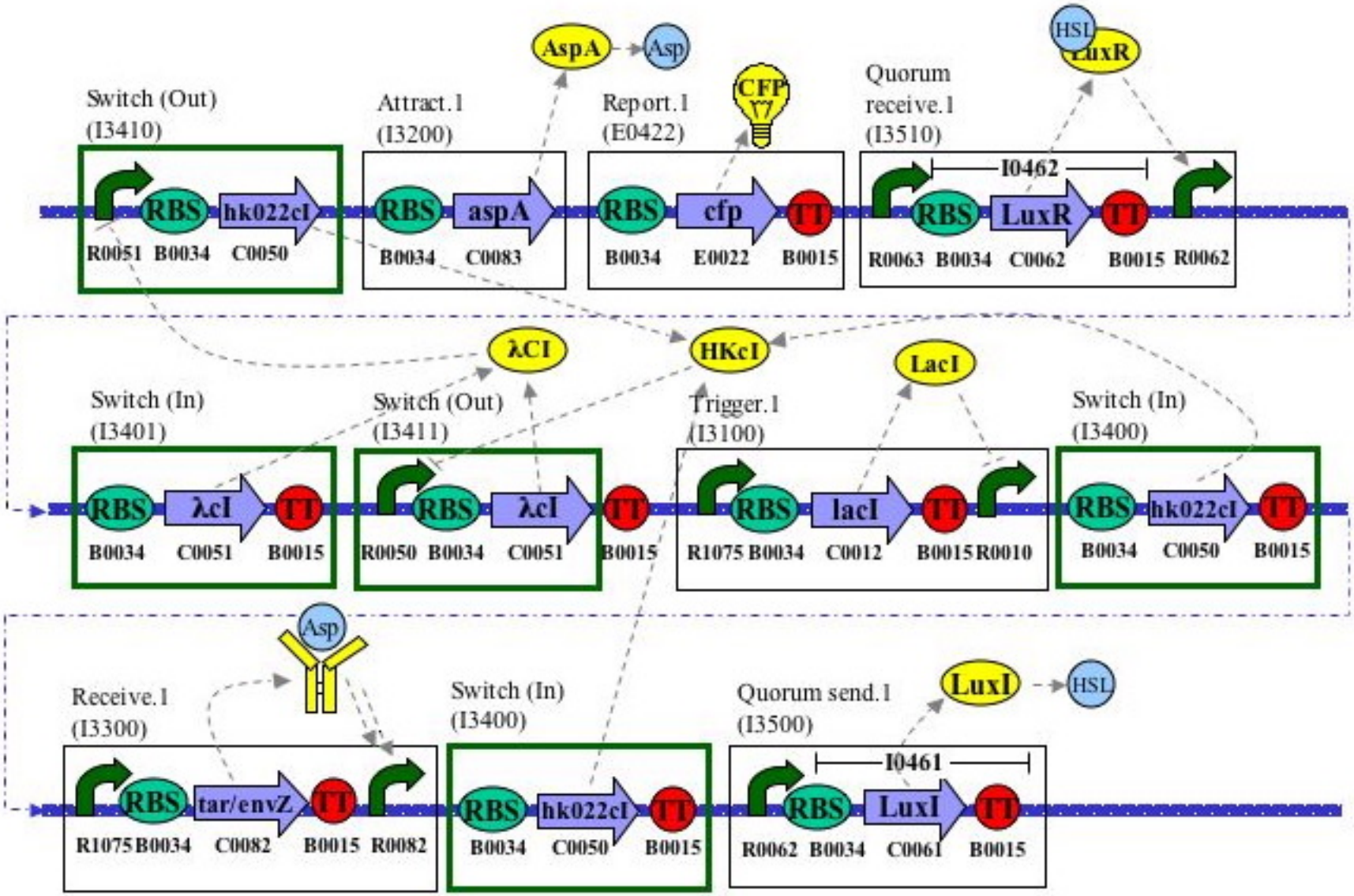
System-Level Timing Diagram



Parts- and Device-Level System Diagram

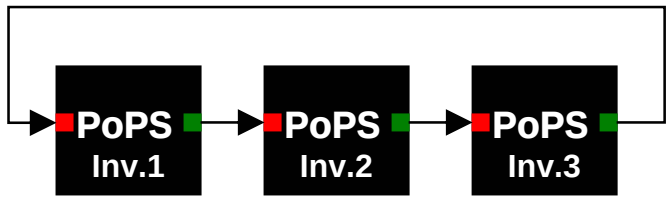


DNA Layout


AspA
Asp
HSL
LuxR
Switch (Out)
(I3410)
Attract.1
(I3200)
Report.1
(E0422)
CFP
Quorum
receive.1
(I3510)
I0462
RBS
hk022cI
R0051 B0034 C0050
RBS
aspA
B0034 C0083
RBS
cfp
TT
B0034 E0022 B0015
RBS
LuxR
TT
R0063 B0034 C0062 B0015 R0062
λCI
HKcI
LacI
Switch (In)
(I3401)
Switch (Out)
(I3411)
Trigger.1
(I3100)
Switch (In)
(I3400)
RBS
λcI
TT
B0034 C0051 B0015
RBS
λcI
TT
R0050 B0034 C0051 B0015
RBS
lacI
TT
R1075 B0034 C0012 B0015 R0010
RBS
hk022cI
TT
B0034 C0050 B0015
Asp
Receive.1
(I3300)
Switch (In)
(I3400)
Quorum send.1
(I3500)
LuxI
HSL
I0461
RBS
tar/envZ
TT
R1075 B0034 C0082 B0015 R0082
RBS
hk022cI
TT
B0034 C0050 B0015
RBS
LuxI
TT
R0062 B0034 C0061 B0015

An Abstraction Hierarchy

Systems

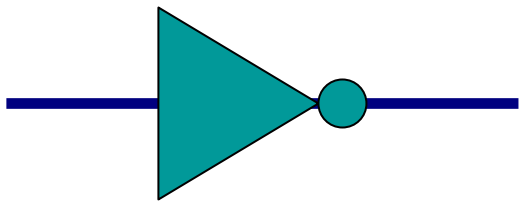


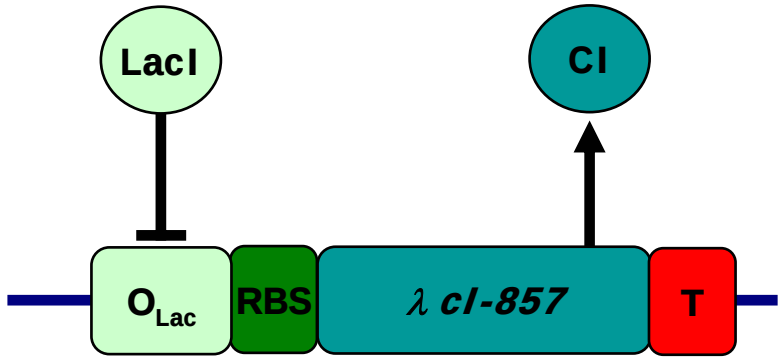
Devices

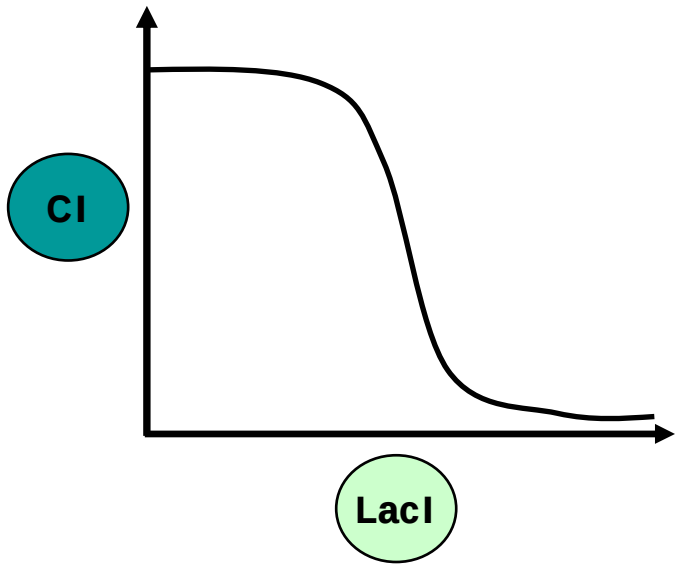
Parts

Zif268, Paveltich & Pabo c. 1991

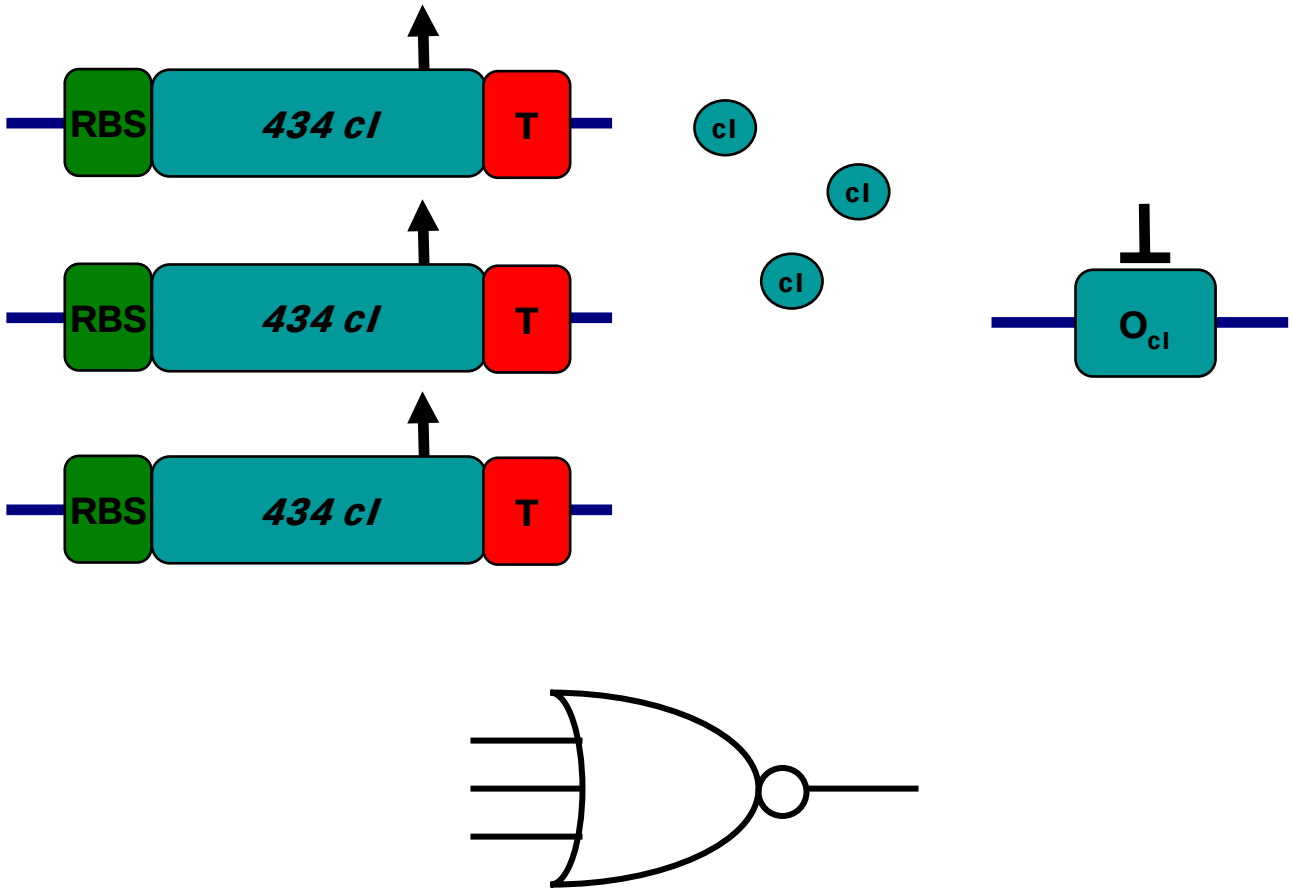
Devices







PoPS NOR Gate



Registry of Standard Biological Parts

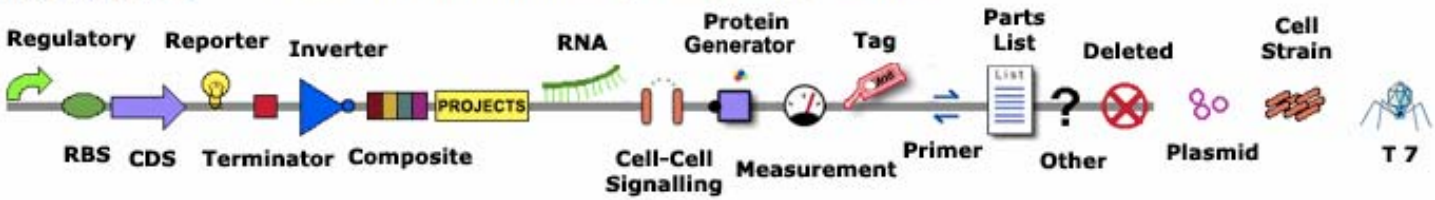
Massachusetts Institute of Technology

View Part

BBa_

Parts Catalog

Click on the icons below to see parts by category. more...



Web Site Update

Registry web site changes in support of iGEM 2005 are under way.
- The new account manager is in place with better support for groups, group leaders, and editing.
- Part categories are becoming more detailed, see the signalling category for an example.
- The new part viewer and editer is on the way soon.
- New Rolling Assembly tool under development.

Educational Programs

The Registry supports design classes where students make simple systems from standard, interchangeable biological parts and operate them in living cells.

Thirteen schools are participating in the **2005 Intercollegiate Genetically Engineered Machine** competition (**iGEM 2005**). The schools are: Berkeley, Caltech, Cambridge, Davidson, ETH Zurich, Harvard, MIT, Oklahoma, Penn State, Princeton, Toronto, UCSF, and UT Austin.

Employment

The Registry is looking for full-time Technical Assistants and Web Programmers. Please contact Staffing Services at MIT for details: Technical Assistant, Web Programmer.

Part Characterization

	Name	Type	Direction	Reversed Version	Biology	Efficiency * Fwd.	Rev.	Length
A	BBa_B0010	Terminator	Forward	BBa_B0020	T1			81
A W	BBa_B0011	Terminator	Bidirectional	BBa_B0021	LuxlA	0.419	0.636	47
A X	BBa_B0012	Terminator	Forward	BBa_B0022	T7 TE	0.309	-0.368	41
A X	BBa_B0013	Terminator	Bidirectional	BBa_B0023	T7 TE	0.6	-1.09	47
A W	BBa_B0014	Terminator	Forward	BBa_B0024	B0012, B0011	0.604		95
A W	BBa_B0015	Terminator	Forward	BBa_B0025	(B0010, B0012)	0.984	0.295	131
A	BBa_B0016	Terminator	Forward		T7 RNAP, T_Phi			48
A	BBa_B0017	Terminator	Forward		B0010.B0010			169
B	BBa_B0020	Terminator	Reverse	BBa_B0010	T1 (reversed)			82
A W	BBa_B0021	Terminator	Bidirectional	BBa_B0011	LuxlA (reversed)	0.639	0.419	47
A X	BBa_B0022	Terminator	Reverse	BBa_B0012	T7 TE (reversed)	-0.368	0.309	41
A X	BBa_B0023	Terminator	Bidirectional	BBa_B0013	T7 TE (reversed)	-1.09	0.6	47
A	BBa_B0024	Terminator	Reverse	BBa_B0014	(B0012.B0011) reversed		0.604	95
A W	BBa_B0025	Terminator	Reverse	BBa_B0015	(B0010,B0012) reversed	0.295	0.984	130
	BBa_B0050	Terminator	Bidirectional	BBa_B0060	pBR322			34
	BBa_B0051	Terminator	Bidirectional	BBa_B0061	yciA/tonA			36
	BBa_B0052	Terminator	Forward	BBa_B0062	rrnC			42
	BBa_B0053	Terminator	Forward	BBa_B0063	His			73
	BBa_B0060	Terminator	Bidirectional	BBa_B0050	pBR322 (reversed)			34
	BBa_B0061	Terminator	Bidirectional	BBa_B0051	yciA/tonA (reversed)			36
	BBa_B0062	Terminator	Reverse	BBa_B0052	rrnC (reversed)			42
	BBa_B0063	Terminator	Reverse	BBa_B0053	His (reversed)			73

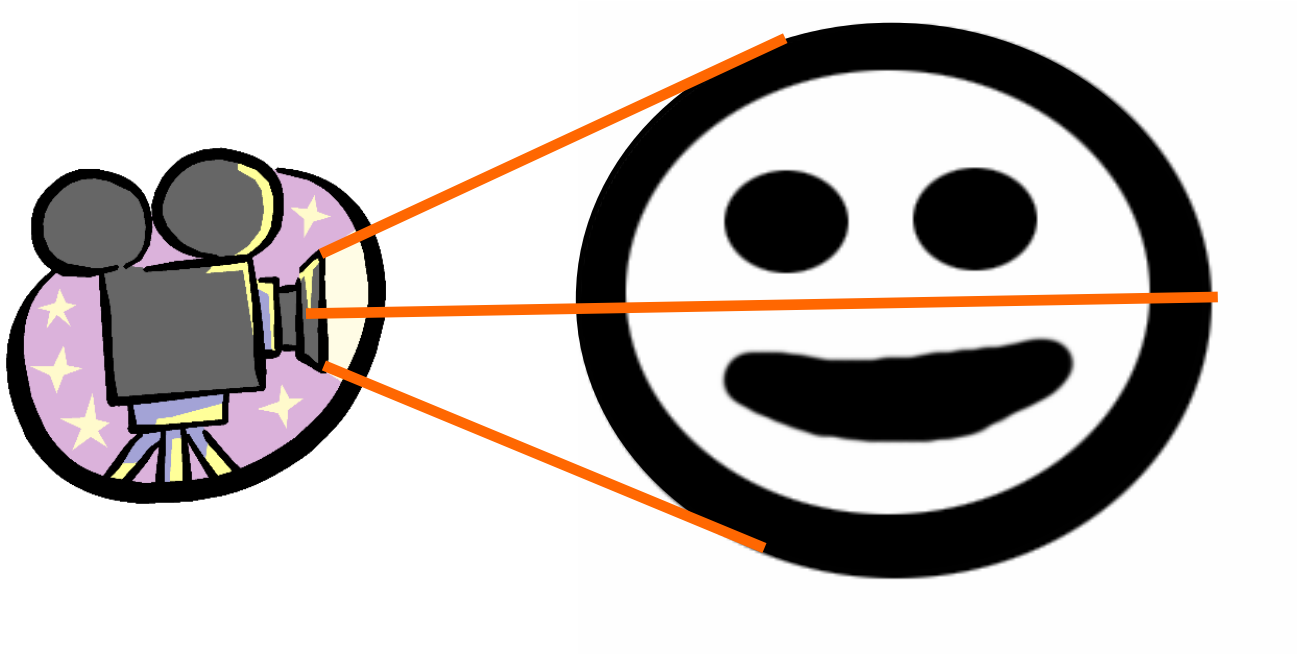
Parts Repository

- Over 500 available parts
- Over 1000 parts specified

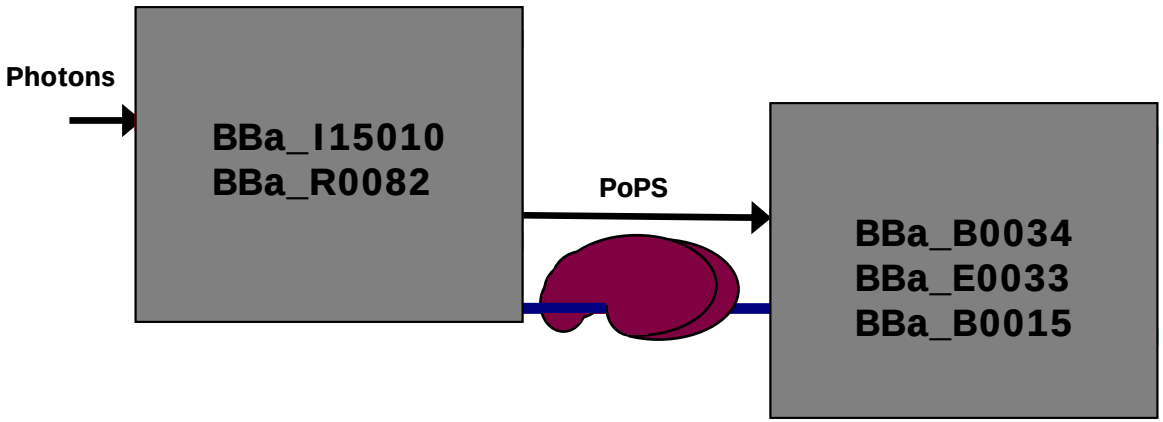
Synthetic Biology Competition 2004

- Five Schools:
  BU, Caltech, MIT, Princeton, and UT Austin
- Large DNA Synthesis budget
- Funded by NSF with support from DARPA
- Jamboree in November 2004

UT 2004 SB Competition Team

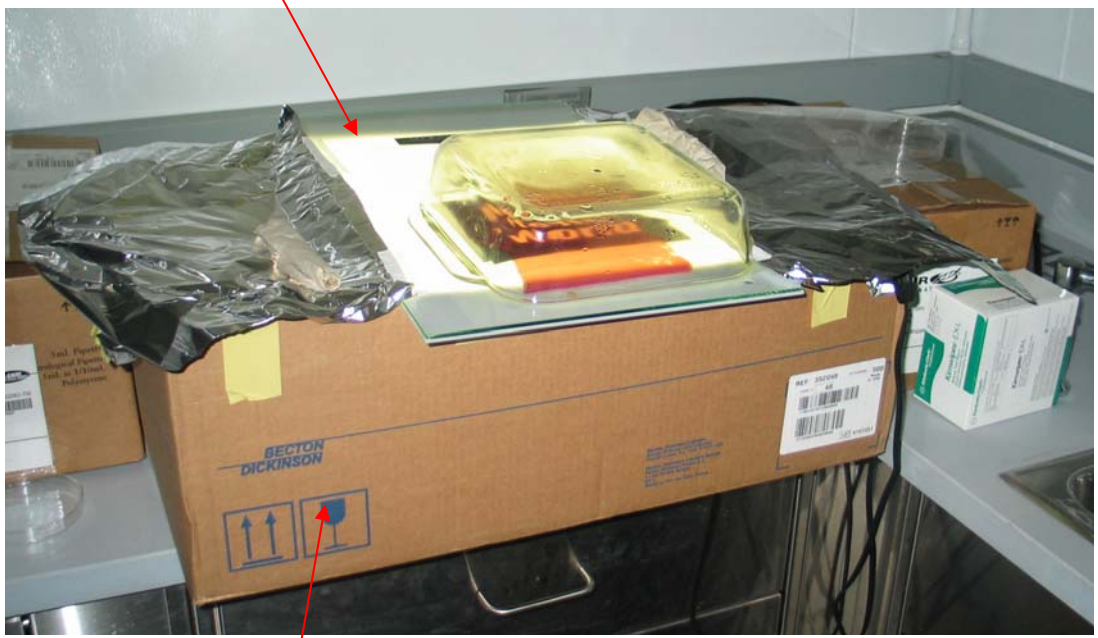


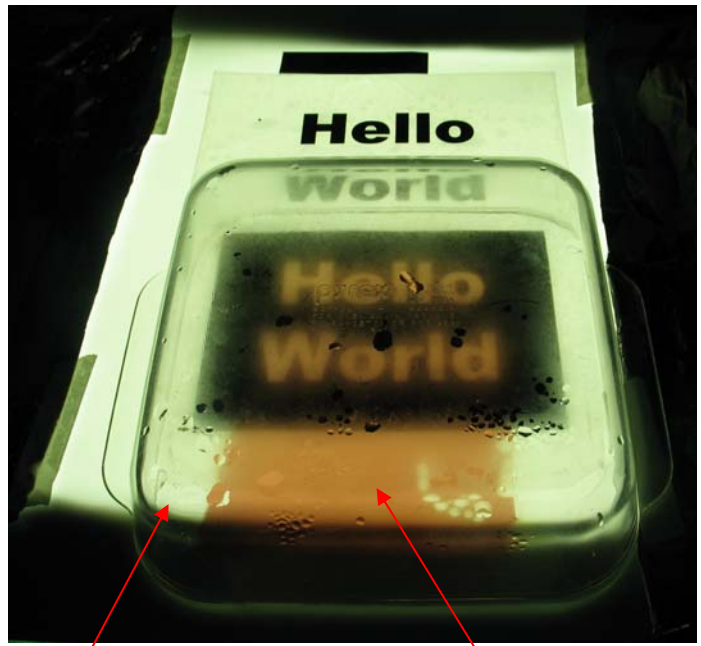
UT 2004 SB Competition Team



UT 2004 SB Competition Team

Lens ripped off of overhead projector





Thermostable chassis

Casserole dish

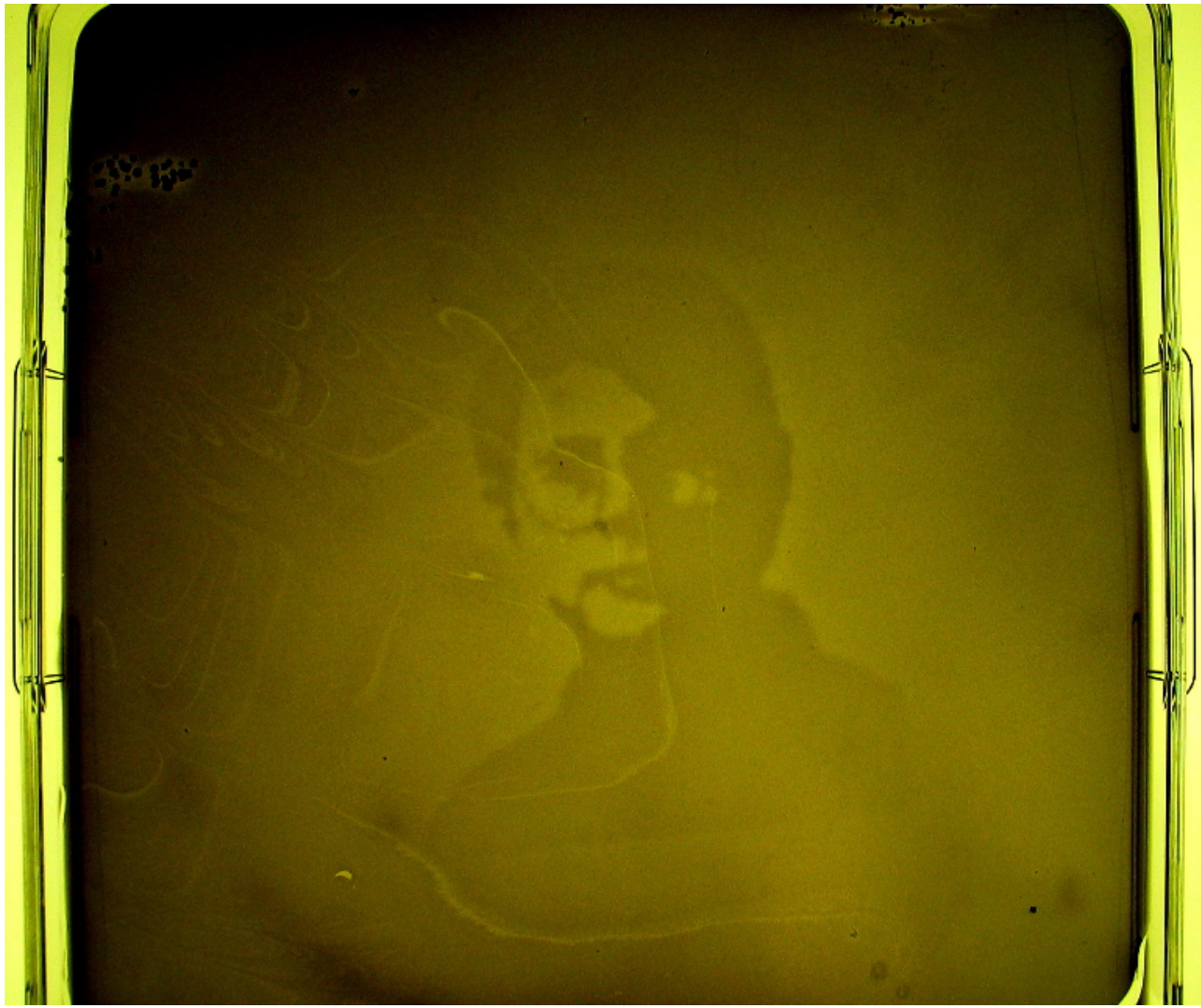
Pile of cells/agar

c/o Jeff Tabor

UT 2004 SB Competition Team

c/o Jeff Tabor

Escherichia ellington



c/o Jeff Tabor & colleagues

iGEM 2005

- intercollegiate Genetically Engineered Machine Competition
- 13 Schools

Caltech	MIT	UC Berkeley
Cambridge, UK	Oklahoma	UCSF
Davidson	Penn State	UT Austin
ETH, Zurich	Princeton	
Harvard	Toronto, Canada	

- Jamboree, November 2005
- Sponsored by Microsoft/MIT iCampus and Harvard
- iGEM 2006, and beyond

Is Synthetic Biology Good or Bad?

The Real Paper

...ly newspaper July 16, 1977 35¢

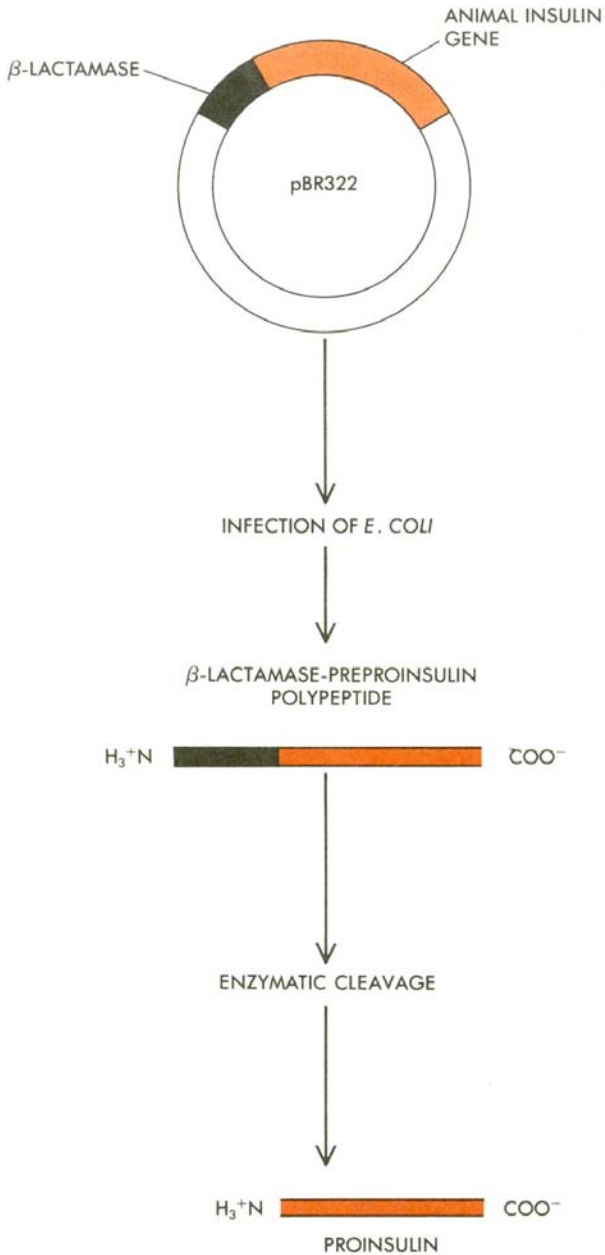
DOING DNA AT HOME: A RECIPE FOR BOTULISM

PAT CADDELL: CARTER'S GREASY POLLSTER

SHAPIRO: THEY'RE BANNING ABORTIONS AGAIN

Mark Fisher

CAUSING EXPRESSION OF EUKARYOTIC GENES IN E. COLI



From: XXXX
Subject: Endy Letter
Date: January 6, 2005 9:45:17 AM EST
To: endy@mit.edu

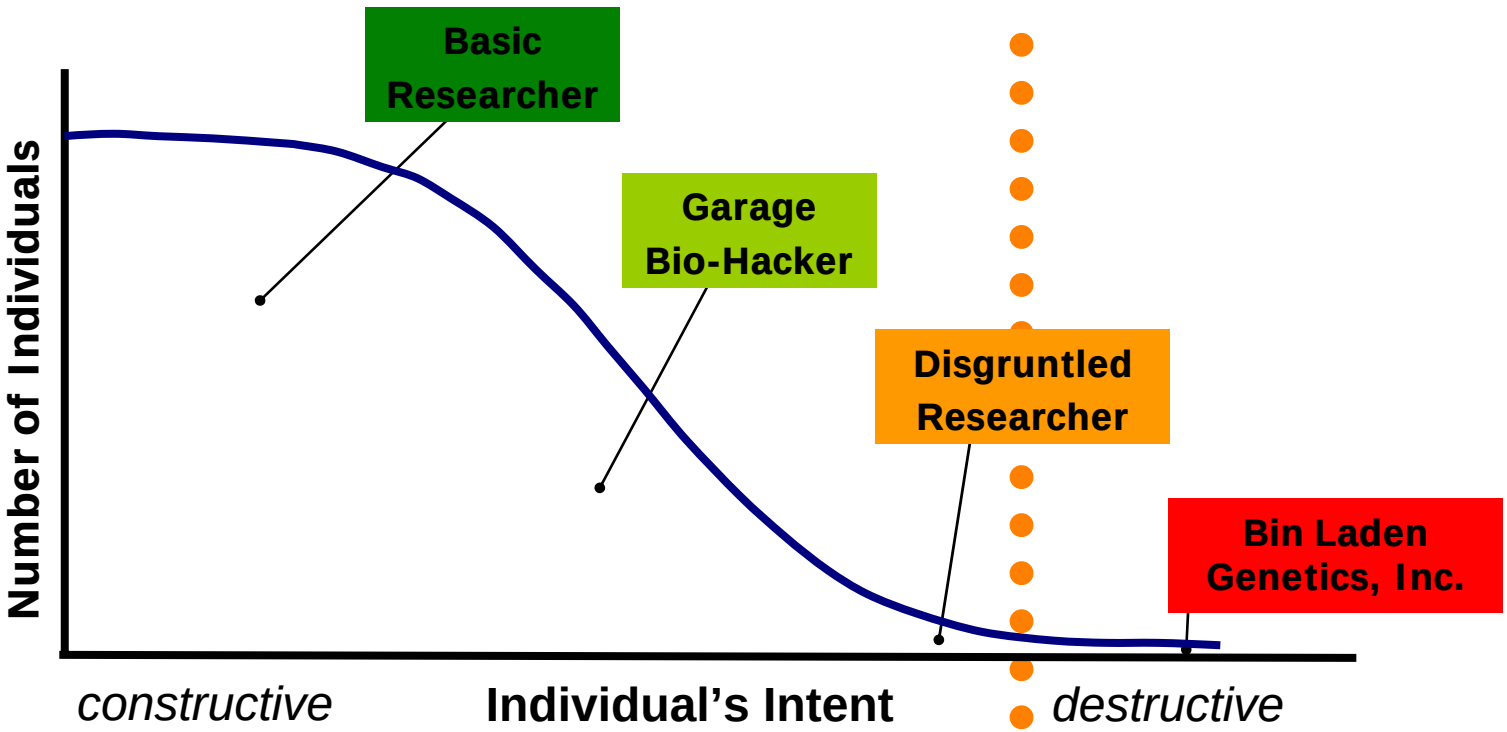
Dr. Endy,

I am a sophomore at XXXXX High School in Connecticut and have recently taken an interest in Synthetic Biology.I am writing to ask for your help because i am having difficulty in obtaining information,and understanding some of the information i already have. Anything you can send my way would be greatly appreciated…

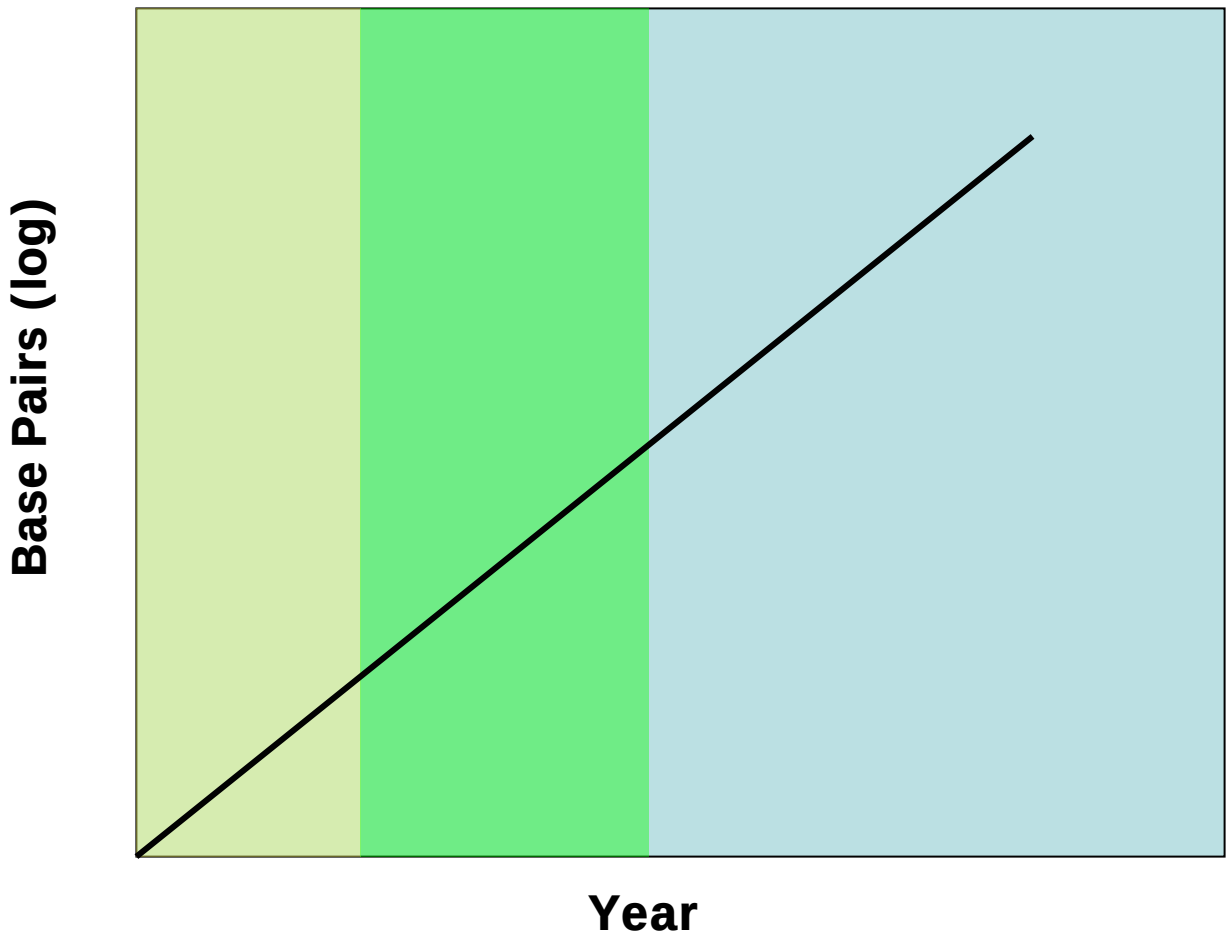
…I will soon begin working on a proposal to create a BioBrick, any information you can send me on their creation would be excellent.

-Sincerely,
XXXX XXXX
XXXX High School
-Grade 10

Biological Risk: Suite of Solutions



DNA Synthesis



CinnaGen Biotech

Back to list of items Listed in category: Business & Industrial > Healthcare, Lab & Life Science > Lab Equipment > Analyt

ABI Applied Biosystems 3948 DNA Synthesizer

Buyer or seller of this item? Sign in for your status

Larger Picture

Buy It Now price: US $12,995.00

Buy It Now >

Item location: Iowa
United States

Ships to: Worldwide

Shipping costs: Check item description and payment instructions or contact seller for details

Shipping, payment details and return policy

Description

National Impact & Issues

1. **Biology is our next technology.**
   Are we going to compete or not?

2. **Future biological risks & national defense?**
   Risk of not knowing what can be done
   Risk of not being able to monitor
   Risk of not being able to respond
   …

3. **Widespread acceptance of responsibility for direct manipulation of genetic information.**

4. **World-wide leadership in the constructive technical and economic development of biological technology.**